Claims

[c1] 1.A method of preparing a dialkyl carbonate, comprising:

reacting an alkanol, oxygen, carbon monoxide, and a catalyst to form a mixture comprising a dialkyl carbonate, an alkyl chloroformate, hydrochloric acid, water, carbon dioxide, and carbon monoxide; and passing said mixture through a fluid passageway at a temperature of about 30 ° C to about 130 ° C and for a residence time of about 0.5 hour to about 10 hours.

[c2] 2.The method of Claim 1, wherein said alkanol comprises a C_{1}-C_{12} alkanol.

[c3] 3.The method of Claim 1, wherein said alkanol comprises a $C_{1 6}$-Cprimary alkanol.

[c4] 4.The method of Claim 1, wherein said alkanol comprises methanol.

[c5] 5.The method of Claim 1, wherein said alkanol, said oxygen, and said carbon monoxide are reacted in a molar ratios of (about 0.5 to about 0.7 alkanol): (about 0.04 to about 0.06 oxygen):(about 0.8 to about 1. 2 carbon monoxide).

[c6] 6.The method of Claim 1, wherein said catalyst comprises a metal selected from the group consisting of iron, copper, nickel, cobalt, zinc, ruthenium, rhodium, palladium, silver, cadmium, rhenium, osmium, iridium, platinum, gold, mercury, and combinations comprising at least one of the foregoing metals.

[c7] 7.The method of Claim 1, wherein said catalyst comprises copper.

[c8] 8.The method of Claim 1, wherein said catalyst comprises hydrochloric acid.

[c9] 9.The method of Claim 1, wherein said catalyst comprises hydrochloric acid and copper in a molar ratio of about 0.5 to about 1.5.

[c10] 10.The method of Claim 1, wherein said fluid passageway comprises a heat exchanger.

[c11] 11.The method of Claim 1, wherein said fluid passageway comprises a holding vessel.

[c12] 12.The method of Claim 1, wherein said fluid passageway comprises a plurality of holding vessels.

[c13] 13.The method of Claim 1, wherein said fluid passageway comprises a section having a length to volume ratio of at least about 5.

[c14] 14.The method of Claim 13, wherein passing said mixture through a fluid passageway comprises passing said mixture through at least one section having a length to volume ratio of at least about 5 for at least about 50% of the total residence time spent in said fluid passageway.

[c15] 15.The method of Claim 1, further comprising condensing said mixture prior to passing said reaction mixture through said fluid passageway.

[c16] 16.The method of Claim 1, further comprising removing hydrochloric acid from said mixture.

[c17] 17.The method of Claim 16, wherein said removing hydrochloric acid comprises reducing the concentration of said hydrochloric acid to less than about $1x10^{-3}$ moles per liter.

[c18] 18.The method of Claim 16, further comprising vaporizing said mixture before said removing hydrochloric acid.

[c19] 19.The method of Claim 18, wherein said vaporizing said mixture comprises heating said mixture, reducing the pressure applied to said mixture, or both.

[c20] 20.The method of Claim 1, further comprising removing carbon dioxide and carbon monoxide from said mixture.

[c21] 21.The method of Claim 20, wherein at least about 90% of said carbon dioxide and at least about 90% of said carbon monoxide are removed from said mixture.

[c22] 22.The method of Claim 20, wherein said removing carbon dioxide and carbon monoxide comprises passing said mixture through a plurality of gas-liquid separation vessels.

[c23] 23.The method of Claim 22, wherein said reacting is conducted at a first

pressure, and said plurality of gas-liquid separation vessels comprises a first gas-liquid separation vessel having a pressure within about 10% of said first pressure, and a second gas-liquid separation vessel having a pressure less than about 20% of said first pressure.

[c24] 24.An apparatus for preparing a dialkyl carbonate, comprising:

means for reacting an alkanol, oxygen, carbon monoxide, and a catalyst to form a mixture comprising a dialkyl carbonate, an alkyl chloroformate, hydrochloric acid, water, carbon dioxide, and carbon monoxide; and

means for removing alkyl chloroformate from said mixture.

[c25] 25.An apparatus for preparing a dialkyl carbonate, comprising:

a reactor for reacting an alkanol, oxygen, carbon monoxide, and a catalyst to a produce a mixture comprising a dialkyl carbonate, an alkyl chloroformate, hydrochloric acid, water, and carbon dioxide; and

a fluid passageway for removing alkyl chloroformate.

[c26] 26.The apparatus of Claim 25, wherein said fluid passageway comprises a heat exchanger.

[c27] 27.The apparatus of Claim 25, wherein said fluid passageway comprises a holding vessel.

[c28] 28.The apparatus of Claim 25, wherein said fluid passageway comprises a plurality of holding vessels.

[c29] 29.The apparatus of Claim 25, wherein said fluid passageway comprises a section having a length to volume ratio of at least about 5.

[c30] 30.The apparatus of Claim 25, wherein said fluid passageway comprises a section having a length to volume ratio of at least about 10.

[c31] 31.The apparatus of Claim 25, further comprising a condenser in fluid communication with said reactor and said fluid passageway.

[c32] 32.The apparatus of Claim 31, further comprising a gas-liquid separator in fluid communication with said condenser and said fluid passageway.

[c33] 33.The apparatus of Claim 25, further comprising an acid removal column in fluid communication with said fluid passageway.

[c34] 34.The apparatus of Claim 25, further comprising an azeotrope column in fluid communication with said fluid passageway.